

What is claimed is:

1. A method of forming a polycrystalline silicon layer, comprising:

forming an amorphous silicon layer on a substrate;

a first step of melting completely the amorphous silicon layer using a laser beam thereby forming the polycrystalline silicon layer by adopting a mask; and

a second step of melting an upper portion the polycrystalline silicon layer using the laser beam by adopting the mask thereby recrystallizing the upper portion of the polycrystalline silicon layer.

2. The method of claim 1, wherein the mask has a completely melting region and a partially melting region.

3. The method of claim 2, wherein the completely melting region and the partially melting region have stripe shapes.

4. The method of claim 3, wherein the completely melting region and the partially melting region are positioned in series.

5. The method of claim 2, wherein the completely melting region of the mask pattern is made of a material having a high light transmittance, and the partially melting region of the mask pattern is made of a material having a low light transmittance.

6. The method of claim 1, wherein the first and second steps are proceeded through one scanning process of moving the substrate having the amorphous silicon layer under the laser beam.

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7. A method of forming a polycrystalline silicon layer, comprising:
forming an amorphous silicon layer on a substrate;
melting said amorphous silicon layer using a laser beam so as to form a polycrystalline silicon layer; and
re-melting an upper portion of said polycrystalline silicon layer using a laser beam so as to re-crystallize said upper portion.

8. The method of forming a polycrystalline silicon layer according to claim 7, wherein said re-melting is performed by passing said laser beam through a mask having a low transparency region.

9. The method of forming a polycrystalline silicon layer according to claim 8, wherein said low transparency region includes a stripe shape.

10. The method of forming a polycrystalline silicon layer according to claim 7, wherein said mask further includes a high transparency region.

11. The method of claim 7, further including moving the substrate relative to a laser beam.

12. The method of claim 7, further including dehydrogenating said amorphous silicon layer before melting.

13. A laser-based crystallization apparatus, comprising:

a laser beam;

a mask receiving said laser beam, said mask including a high transparency region for passing said laser beam with little attenuation, and a low transparency region for attenuating said laser beam;

a projection lens for receiving said laser beam from said mask, said projection lens for focusing said laser beam onto a substrate.

14. A laser-based crystallization apparatus according to claim 13, wherein said low transparency region has a stripe shape.

15. A laser-based crystallization apparatus according to claim 13, wherein said high transparency region has a stripe shape.

16. A laser-based crystallization apparatus according to claim 13, wherein said substrate moves relative to said laser beam.

17. A laser-based crystallization apparatus according to claim 13, wherein said laser beam is an excimer laser beam.

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